New insights into phloem unloading and expression of sucrose transporters in vegetative sinks of the parasitic plant Phelipanche ramosa L. (Pomel)

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Résumé en anglais	The plant-parasitic plant interaction is a interesting model to study sink-source relationship and phloem unloading. The parasitic plants, such as the achlorophyllous plant Phelipanche ramosa, connect to the host phloem through the haustorium and act as supernumerary sinks for the host-derived photoassimilates, primarily sucrose. The application of the fluorescent symplastic tracer, carboxyfluorescein (CF) derived from carboxyfluorescein diacetate (CFDA), to the leaves of the host plant (Brassica napus) showed direct phloem connections at the host-parasite interface. These experiments also evidenced the dominant apoplastic pathway for phloem unloading in major vegetative sinks of the parasite, including tubercles and shoots, except the adventitious root apices. The CF experiments showed also the symplastic isolation of the phloem tissues from the sink tissues in tubercle and shoot of the parasite, then suggesting the pivotal role of sucrose transporters in sucrose unloading in P. ramosa sinks. Three cDNAs encoding sucrose transporters (PrSUT) were isolated from the parasitic plant. PrSUT1 transcripts accumulated at the same level in the tubercle throughout the parasite growth while a significant increase in transcript accumulation occurred after emergence in the flowering shoot, notably in the growing apical part. The in situ hybridization experiments revealed the PrSUT1 transcript accumulation in the mature phloem cells of both subterranean and flowering shoots, as well as in shoot terminal sinks corresponding to apical meristem, scale leaf primordia and immature vasculature. The transient expression experiments in Arabidopsis protoplasts showed that PrSUT1 was localized at the plasma membrane, suggesting its role in phloem functioning and sucrose uptake by the sink cells in P. ramosa. Conversely, the PrSUT2 transcript accumulation was constantly low in tubercles and shoots but PrSUT3 transcripts accumulated markedly in the subterranean and flowering shoots, in concordance with the PrSUT3 mRNA accumulation in multiple sink areas including apical meristem, scale-leaf primordia, immature vasculature and even storage parenchyma. However, the PrSUT3 transcripts did not accumulate in the mature phloem cells. The transient expression experiments in Arabidopsis protoplasts suggested a tonoplast localization of PrSUT3, for which nevertheless the involvement in intracellular sucrose transport needs clarification.
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